

Fodder Crops in the Madras Presidency—A Review

By G. N. RANGASWAMI AYYANGAR, F. N. I., I. A. S.

Millets Specialist and Geneticist,

and

T. R. NARAYANAN, B. A. (Cantab), B. Sc., A.R.,

Assistant, Millets Breeding Station, Coimbatore.

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Introduction. India has to maintain a dense population of over 200 per square mile, by methods of farming applicable only to tracts with about 2 persons to the square mile. The chief, and perhaps the only way to remedy the chronic under-nourishment of this dense population is by increasing the *per capita* consumption of milk and milk products. For this, a dove-tailing of arable and animal husbandries into one mixed-farming system is very urgently needed. As pointed out by Mr. Hilson in 1928, "the fodder problem in not only Madras, but the whole of India, is a very important and a very urgent one. Better fodder means better cattle and more manure of better quality; this helps the farmer to raise better crops, get bigger profits and adopt a better standard of living as well as a higher level of mixed farming, with bigger and better fodder crops as an essential unit therein." The difficulty comes in, however, when one tries to formulate mixed-farming systems for all the widely varying conditions of climate and soils in India. For instance, in Sind and certain parts of the United Provinces, the introduction of irrigation into the existing dryland farming resulted in the deterioration of the excellent breeds of cattle that thrived there before. For efficient milk production, the nutritive ratio of the feed, i. e., the ratio between the digestible crude proteins and the combined digestible fats and carbohydrates, should not be wider than 1 : 10. Since, the usually available cereal straws, such as paddy, wheat and ragi, have only a nutritive ratio of 1 : 70 and even the better kinds of green fodders like sorghum and guinea grass

have a ratio of only 1 : 12, the need for including legumes like lucerne and sunnhemp with a ratio of 1 : 4, in the daily feed, would be obvious.

With regard to the fodder crops available, Benson wrote as far back as 1879 from Saidapet, "This country is pre-eminently favoured with forage crops that could, with ordinary farming skill, produce abundant fodder of first rate quality There is no reason why, for want of proper fodder, this country should not produce good livestock, instead of the miserable, degenerate animals that now serve for the cultivation of the fields as well as for transport on the roads." Thus, the urgent need for better mixed-farming methods, giving due prominence to forage crops is obvious; and good forage crops also are available. It would, therefore, be useful to review at this stage the past performance and the present position of all the fodder crops tried in this province so far.

Sorghum (*Sorghum vulgare*). Tamil—*Cholam*. Telugu—*Jonna*. To quote the words of Mr. Benson again, "This crop has scarcely any rival at all as a fodder crop." Being essentially a crop of semi-arid, sub-tropical regions, it is very tolerant to high temperatures as well as low moisture conditions, and is eminently suited to be the mainstay of fodder in regions of low to moderate rainfall. In fact, it needs less water per pound of dry matter produced than perhaps any other cereal crop, its average water requirement being 294 lb per pound of dry matter as against 309 for maize—its nearest rival, 388 for Sudan grass, 375 for teosinte, 470 for wheat and 600 to 900 for leguminous fodders like lucerne and cowpea. It is not however suited, even as a fodder crop, to tracts having long periods of heavy rainfall.

In South India, where 4,632,090 acres are under sorghum, the variety Periamanjil cholam, seems to be the most widely suitable type for fodder. The periods of sowing and of harvest in different parts of the Presidency are summarised below:—

A. Rainfed (91.3% of total area) 1) Early crop; Sown in July—August, harvested by December—January. On the uplands of Vizagapatam and Godavari, and the districts of Bellary, North Arcot, Chittoor, Salem and Coimbatore. 2) Late crop; (a) as a grain crop. Sown—September—October, harvested by January—February. On the deltas of Godavari and Kistna and the districts of Guntur, Nellore, Kurnool, Bellary and Cuddapah; (b) as a fodder crop. The black soils of Madura, Ramnad and Tinnevely.

B. Irrigated. (8.7% of total area). Time of sowing not always definite, but usually sown in February and harvested by June. In the districts of Coimbatore, Madura, Tinnevely, and to a lesser extent in Salem, Trichinopoly, Ramnad, Chittoor, North Arcot, Guntur and Anantapur. The yields of Sorghum in the different stations of the Presidency are given in the following table.

Average yield of Fodder Sorghum, in lb. per acre.

Agricultural Research Stations.	As straw from grain crop		As a pure fodder crop		Variety found most suitable	Remarks.
	Rainfed	Irrigated	Rainfed	Irrigated		
Berhampur Anakapalle Samalkota Maruteru				(Green wt.) 14,970		
Guntur Chintaladevi Hageri Nandyal	2,000		3,500 3,400 3,590	18,450	N 23/10 <i>Pedda Jonna</i> N-29/82	
Palur Tindivanam Aduturai Pattukottai			5,430	14,820 21,830 14,530 15,930	<i>Kaki Jonna</i> <i>Periamanjai</i>	
Central Farm, Coimbatore Hosur Gudiyattam	3,150 3,150	6,460*		23,960 19,120 20,750	<i>Periamanjai</i> "	* Chitrai cholam
Taliparamba and Coconut Stations Pattambi			4,750	10,410	<i>Periamanjai</i> "	Maximum given. Yields very variable.
Koilpattj		5,500	3,540	19,100	<i>Irungu</i>	
Nanjanad (The Nilgiris)			Failure			

Sorghums in different tracts. (The Northern Circars.) Attempts were made at Berhampur in 1932 and 1933 to introduce sorghum as a fodder crop in the paddy fields during the off-season. This could be done only in fields that were sufficiently moist to be ploughed and sown, after the harvest of paddy by the end of December. Even in these fields, the peculiar tendency of the local clay-loams to cake up into hard pans, made one or two irrigations necessary, to help the crop during February and March. The outturn was 10,000 lb. the first year, but the 1933 trial was a failure. At Anakapalle, sorghum as a grain crop did not quite fit in with the local rotations, but for fodder it could be grown both as a rainfed crop in June giving an outturn of 9,000 lb. per acre, as well as under irrigation, after the harvest of summer-ragi in April. The yields ranged in this case from 10,000 to 25,000 lb. per acre. No mention is made of any attempts with sorghum at either of the two deltaic stations, Samalkota and Maruteru.

In the Guntur tract, sorghum is the staple fodder both as a pure fodder crop sown in June and as straw from the October-sown grain crop. It was formerly usual for ryots here to reserve 5-6 acres for pasture, but with the increasing popularity of tobacco cultivation and the consequent rise in land values, they now tend to depend more and more on the upland taluks for

their fodder supply. On the Guntur farm the average yield for the rainfed crop works out to 3,500 lb. of dry fodder per acre. The best variety is found to be the Nandyal N. 23/10. Periamanjil cholam grows well enough, but is inferior in the quality of hay, besides being more liable to rust attack. Experiments to determine the optimum sowing time have shown that from June till the middle of July was the most suitable period. Manuring, with cattle manure as well as fertilizers like ammonium sulphate and superphosphate, was found both useful and economic, the nett profit over five years, working out to Rs. 13/- per acre. To improve the feeding value of the fodder, it was found best to grow sorghum mixed with *pillipesara* (*Phaseolus trilobus*, Ait.) in the ratio of 3 : 1. Higher proportions of the legume tended to pull down the jonna yields.

In the carefully developed dry-farming system of the Ceded districts, sorghum forms a vital unit, the grain being consumed by men and the straw by cattle. The yields are on the average 3,600 lb. of straw per acre at Nandyal and 2,000 lb. at Hagari, although, wherever irrigation was feasible, (as at Hagari) the outturn goes up to 18,450 lb. The variety N. 29/82 was the best at Nandyal, but at Hagari the Coimbatore variety Periamanjil has been found to come up very well as a fodder crop. A number of tests were carried out at both these stations to determine the optimum spacing between drill rows—but the wide seasonal fluctuations made most of the results inconclusive. At Nandyal, the local practice of 10½" between rows was found to be the best on the whole, although in years of poor rainfall, wider spacings of 16" to 28" were often preferable and closer spacings of 8" in good seasons. At Hagari too, the existing local practice of 18" spacing between rows was found to be the most profitable, although wider spacings (21—27") improved grain yields and close spacings increased the outturn of straw. Owing to the large areas of 40—50 acres, managed by a single pair of bullocks, farmyard manure is scarce and quite inadequate for any manuring of sorghum. Experiments indicate that applications of poudrette, ammonium sulphate, and super phosphate could be beneficial in favourable years. However, the low average rainfall (about 20" at Hagari and 28" at Nandyal) makes manuring rather a risky practice, because in droughty seasons, manured plants wither up much sooner than unmanured.

The Ongole breeding tract, with its 33" of rainfall, depends mainly on jonna straw for cattle feed. The yields on the Chintaladevi Farm (1918-1932) averaged about 3,400 lb. of dry fodder from the June-sown rain-fed crop. Here too, manuring was found uneconomic.

In the South Arcot alluvial tract round about Palur, formed by silt deposits from the two rivers Pennaiyar and Gadilam, wells are numerous and consequently the cholam yields too, are high, averaging 14,800 lb. of green fodder per acre. On the Palur Farm Periamanjil cholam has not done very well, the two best types being Kaki jonna from Madanapalle and Sen cholam from Polur. In years of favourable rainfall, it was often possible to raise a ratoon crop yielding up to 8,800 lb. of green fodder from the

June-sown crop of cholam. At Tindivanam too, cholam is the main fodder, and curiously enough, Periamanjol cholam, which did not stand very high at Palur, was the best at this station, giving an average yield of 5,430 lb. rainfed and 21,830 lb. under irrigation. In the Cauvery delta at Aduturai although paddy is the chief food crop and paddy straw the chief fodder, cholam could also be grown successfully, in Samba fields before paddy. The fields were kept ready ploughed and in June, as soon as water was received in the channels, Periamanjol cholam was sown and harvested by September giving an outturn of 14,500 lb. of green fodder in good time for transplanting the main Samba crop afterwards. It is not mentioned, however, what the after-effect was, of such a cholam crop on the yield of the subsequent paddy crop.

Among the districts, Coimbatore stands first in the area under irrigated cholam having nearly 40% of the total of 135,000 acres in the presidency. In rainfed acreage it stands as the fifth. Periamanjol cholam is the dominant variety of the district, with an average yield of 3,150 lb. of straw from the rainfed crop and 23,960 lb. as irrigated green fodder. On the Central Farm, about 25 acres have been under sorghum every year, to meet the fodder requirements of a large dairy herd and about 40 pairs of work cattle. It has been grown here on quite a variety of soils, black soil dry lands, red soil dry lands, red soil garden lands, and even in the heavy wetland paddy soils. The cost of production in this last instance worked out very cheap being only 4 as. per 1,000 lb. of green fodder, as against Rs. 2/- in the garden lands. It was observed at the Central Farm, that the fodder yields of Periamanjol cholam, when sown between August and January were poorer than when sown from February to July, as the crop tended to rush to flower from September to January. Hence for these months, fodder maize was preferable, as it gave uniform yields all the year through, while from February till July, sorghum was better.

The sorghum crop, especially when sown thick for fodder, is notorious for pulling down the yields of crops that follow it. This has been traced to the activity of the dense network of cholam roots tending to make the soil somewhat alkaline, for about a year afterwards. Attempts were made at the Cotton Breeding Station, Coimbatore and at Koilpatti, to ameliorate this deleterious after-effect by mixing legumes like sunnhemp cowpea, pillipesara, cluster beans and lablab, along with sorghum, in various proportions, but none of them was very effective. However, a mixture of three parts of cholam with one of pulse, preferably cluster beans in the garden lands (at Coimbatore) and lablab (*D. lablab*) in the dryland black soils, was found to improve the feeding value of the mixed fodder, without affecting appreciably the sorghum outturn.

At the Millets Breeding Station, an exclusive fodder strain, A. S. 3355, characterised by very sweet and juicy stalks, with about 12% sucrose content, has been evolved from the Patcha jonnas of Nandyal.

It is well known that fodder crops are best cut soon after they flower, and sorghum is no exception to this. It is however dangerous to feed it before flowering, especially in cases where the crop after a vigorous start, got stunted through by subsequent adverse weather conditions. It then contains a cyanogenetic glucoside in quantities sufficient to prove fatal to animals. It has also been noted that a ratoon crop is usually more poisonous in the early stages than a similar stage of the original crop.

With regard to the feeding value of sorghum, certain preliminary experiments at Coimbatore indicate that the relative efficiency, i. e., the quantity of fodder consumed per pound of milk produced, is in the descending order, Guinea grass, fodder sorghum, and then fodder maize.

At the Central Cattle Farm at Hosur, about 30—40 acres are put under irrigated sorghum each year besides a large area of rainfed crop. The average yield is 3,150 lb. for the rainfed and 19,120 lb. for the irrigated crop.

The heavy rainfall on the West Coast militates against sorghum being ever popular there, but all the same Periamanjai cholam has been grown with fair success at Taliparamba and on the Coconut Stations, both in the wetland areas and as a rainfed June crop on the modan lands (hilly upland areas). The yields, of course, have been very variable, ranging from 4,000 to 10,400 lb. of green fodder per acre, with an ever-present possibility of the crop getting swamped out by heavy rains. Further south at Pattambi, where the annual precipitation is nearly 40% less than at Taliparamba, the yields have been less variable, with an average of 4,750 lb. green fodder per acre.

In the Southern tract of Madura, Ramnad and Tinnevely, where there are 265,000 acres of rainfed cholam and 136,000 acres of irrigated cholam, cholam is very important as a fodder crop. It is generally sown in September—October as a rainfed crop on the black soils, in rotation withumbu the staple food crop and cotton the cash crop, and harvested by February. The seed rate is as a rule very high, sometimes going up even to 120 lb. per acre, although tests at the Koilpatti farm, point towards 80 lb. as the optimum. With higher seed-rates, the fodder which is already fine and thin-stalked gets still thinner and finer, but as the amount of grain recovered falls short of the seed sown, the practice is uneconomic.

The variety best suited to the Southern tract is, undoubtedly the local irungu type (*Sorghum dochna* (Forsk) var *irungu* (Burkill, Snowden). This type is shorter in duration, more drought resistant and less susceptible to earhead bugs and sugary disease than Periamanjai cholam. Persistent attempts to introduce this on the Koilpatti Farm, have not met with success. Periamanjai does not also stand crowding so well as irungu does. Even when its yields do exceed the local type, the stalks are so much stouter and coarser that what is gained in outturn is lost in feeding.

After numerous tests, 6" between drill rows have been found to be the best spacing in this tract. The time of sowing, in a tract so completely

dependent on the north-east monsoon, is of course determined by the earliness or otherwise of the rains. Since, hardly any moisture is left in the soil by December, as a rule, the earlier the sowing, the better the yields. The crop is usually allowed to get fully dry before harvesting. The earheads are first clipped off and then the straw cut by sickles and stocked in the field for a day or two before being carted away and stacked up. It was found at the Farm that cutting the crop earlier, at the (short-blade) stage itself, gave a definitely better quality of fodder, even though the outturn was somewhat less, and moreover the yield of the subsequent cotton was not so adversely affected as when cholam was cut after setting seed. But against this practice there were two very strong objections, one sentimental, the ryot looking upon it as something akin to infanticide, and the other practical, owing to his inability to recover any seed for subsequent sowings, unless by laying down separate seed multiplication plots. The average yield for a rainfed irungu crop in the black soils of the Farm, works out to 3,540 lb. of dry fodder per acre. On the red soils, under irrigation the yields are 5,500 lb. dry straw from a grain crop, and 19,100 lb. green material from a fodder crop.

Certain early trials with 'nitrolim' and 'fish guano' showed 46—60% increases in yields, but later experiments (1930—1934) with ammonium sulphate and super-phosphate proved that manuring was uneconomic, as the increases were insufficient to cover the cost of fertilizers.

Besides the attempts to introduce periamanjai cholam, trials were also made here with certain foreign types as well. Thus, in 1915—16, a variety from the Belgian Congo was tried under irrigation and in 1932 a Bombay type, Bilichigan cholam was grown on the black soils, but neither had any success. The Belgian Congo type grew well enough, upto 10 feet in height and tillered very freely, was sweet stalked and well relished by cattle, but the seed setting was so poor that it had to be discontinued. The Bilichigan cholam was severely affected by 'calacoris' bugs.

On the Hills, although sorghum was a failure at Nanjanad, Periamanjai cholam has been a regular fodder crop at the Imperial Dairy Farm at Wellington and also in some places round about Coonoor (6,000 ft. above Sea level). The yields at the Dairy Farm range from 10,000 to 15,000 lb. of green fodder per acre.

Certain exotic types, such as "Chinese sugarcane" and "Planter's Friend" (at Saidapet in 1871), American types Red Kafir and Dwarf Milo in 1910 at the Central Farm, Coimbatore and *S. margaretiferum* in 1932 at Taliparamba, have been tested, but none of them have proved suitable for South Indian conditions. A few Bombay types of Jowar tried at Hagari in 1934, were found to mature earlier and thus escape the drought.

Sudan grass (*Sorghum sudanense*) was noted as promising at Hagari in 1917 and at the Central Farm in 1919; here it was sown in July and gave a single cutting of 9,100 lb. per acre in October, but dried up

thereafter and is not mentioned afterwards. This popular fodder grass of America and Australia does not seem to have a future in this Presidency.

Maize (*Zea mays*). Although this crop often equals sorghum in fodder outturn and is in some respects even superior, on account of its quicker growth, non-poisonous nature, and uniformity of yield all through the year, it is not so hardy or so widely adaptable to soil and climatic variations as sorghum. It was a common irrigated fodder on the Saidapet Farm, the yields varying from 12,000 to 17,000 lb. More recently, in the Northern Circars it has not been a success, either as an early or as a late crop, but at Guntur it has been grown regularly as a rainfed crop from 1923 onwards in both the early and late seasons, although the yields have ranged only from 1,640 to 4,100 lb. of green fodder. At Hagari it is an irrigated fodder since 1931, with an outturn of 4,350 to 11,600 lb. Consequent on poor yield of 2,200 lb. it was not continued at Nandyal, after its first trial in 1930. On the Ongole Cattle Farm at Chintaladevi it was a rainfed crop off and on from 1921 to 1932. The yields here too, as at Guntur, were only moderate, averaging merely 4,000 lb of green fodder per acre. On the East Coast, Palakuppam was the only place where it was tried and there it proved in 1927 an effective trap-crop for the parasitic weed striga. The next year, maize was grown in the same field and gave a striga-free crop of 4,900 lb. per acre. At Coimbatore it has been a favourite forage crop since 1910 in maintaining a large dairy herd. Unlike sorghum, which tends to rush to flower, and gives a smaller outturn from sowings in September to January, the yields from maize are fairly uniform all through the year; hence from August to January it is better to grow maize for fodder, reserving sorghum for the other months of the year. At Hosur also, maize has been a close second to sorghum as a main-stay of green fodder for milch cows, with an average outturn of 13,300 lb. It was observed here that if maize was cut and fed at the right stage, i.e., just when the cobs were forming, there was a marked improvement in milk yields. Once this stage was passed the feeding value deteriorated very rapidly, and it is therefore important to utilize this fodder just at the right stage. On the West Coast, maize was tried as a rainfed inter-crop in the coconut plots at Kasargod in 1930 and gave 3,500 lb. green fodder per acre. Further South at Pattambi, however, the yield was much poorer, never exceeding 2,000 lb. as a rainfed crop on *modan* lands. It was a failure in wetlands also. At Koilpatti it has occasionally been grown under irrigation in the red soil area. The yields were usually only moderate ranging from 3000 to 3,800 lb., except in 1936, when, consequent on a heavy dressing of poudrette, it shot up to 30,800 lb. per acre.

Teosinte (*Euchloena mexicana*). This ancestor of maize from Central America was introduced at Saidapet about 1881, and in 1885 Benson reported on it thus: "It is doubtless a heavy yielder, but cannot withstand drought and is therefore limited in its scope to moist tracts or where irrigation is possible. The fodder is moreover very watery and devoid of any

sugary matter and is not quite palatable to stock." In 1932, it was introduced at Coimbatore and after trials at various other centres was found to be inferior to sorghum as a rainfed crop, although equal to it under irrigation. Contrary to Benson's report, however, it was very well relished by stock at Hosur, being distinctly sweet at the flowering stage and like maize capable of stimulating milk production when cut and fed at that optimum stage. At Guntur it gave 4,000 lb. green fodder as an early sown crop and 2,900 lb. in the "pairu" or late season. Cattle relished it better than jonna, but the outturn was less. At Palur too, the July sown crop was a success, yielding 34,800 lb. per acre and was about two weeks earlier than fodder sorghum, but the October sowings gave only 3,600 lb. Too much moisture in October proved detrimental to its success when sown in September at Aduturai (1932), but the March sowings fared better, and produced 6,200 lb. per acre. The average at Aduturai works out only to 4,100 lb., so that it cannot be classed as a great success in the Tanjore delta. At Coimbatore, teosinte has been grown regularly since 1932, but only on about 20-25 cents each year. The average yield comes to 28,400 lb. per acre, as compared to 21,100 lb. from sorghum. At Hosur, the yield was 25,100 lb.; at Taliparamba it was 20,800 lb. under irrigation, but the yield as a rainfed crop was only 930 lb. At Pattambi, however, both the irrigated as well as rainfed crops were failures. At Koilpatti also the dry land yields were disappointing, being only 1,500 lb. green, but the irrigated yields were better, averaging 10,200 lb. On the hills it has been a success, producing 19,500 lb. green fodder per acre.

Guinea grass (*Panicum maximum*). This grass, a native of tropical Africa was introduced into South India, about 1870 and has now become so well acclimatised as to be classed as one of the best fodder crops available. It is a tufted, profusely tillering, surface feeding, perennial grass that thrives best on well drained loams. With liberal irrigations and manuring it gives its first cutting six months after planting and thereafter continues to yield well for about three years without replanting, at the rate of seven or eight cuttings a year. It thrives well on sullage water and can also be conveniently grown along field bunds and sides of water channels, providing a nutritious succulent fodder for milch cows and young stock.

Napier's Fodder (*Pennisetum purpureum* old name - Elephant grass) is similar but often gets more rank and coarse than guinea grass. In 1872, a tall grass was noticed growing in the midst of a paddy crop at Saidapet, grown from purchased seed. The seeds from this grass, when collected and sown next year, gave the first cut within 83 days, with a total annual outturn of 21,000 lb. per acre. In 1917 this grass (*Pennisetum purpureum*) was re-introduced at Coimbatore with seed obtained from the South African Department of Agriculture and soon proved to be the heaviest producer of green material ever grown on the farm, the average annual yield of 99,200 lb. being nearly twice that of guinea grass and four times as much as fodder sorghum. Although, on analysis it showed a higher moisture content, in

practical feeding it was found that the serrated leaf edges caused mouth-sores in cattle, so that they could not consume it in quantities sufficient for heavy work or milk production. Hence, guinea grass was on the whole the better fodder, though Napier's fodder was a heavier yielder. At Samalkota, guinea grass produced 86,500 lb. per acre per annum. At Guntur both the grasses have been grown regularly from 1931 onwards, on about half an acre of garden land, with an average outturn of 15,400 lb. At Hagari, the yields were poor in the beginning, being only about 4,500 lb. but after 1926, probably as a result of better cultivation, they have improved to an average of 13,000 lb. per acre. At Chintaladevi, guinea grass was both a rainfed as well as an irrigated crop with an yield of 5,000 lb. and 22,000 lb. respectively. Both the grasses have figured with success at Palur since 1917, guinea grass yielding 23,000 lb. and Napier's fodder 48,000 lb. The average cost works out to 356 lb. per rupee for the former and 462 lb. for the latter. At Tindivanam, guinea grass was somehow very poor, yielding only 3,200 lb. against 24,900 lb. from Napier's fodder; but at Aduturai they were both equally good, producing as bundside grasses an annual outturn of 37,600 lb. per acre. On the Central Farm, guinea grass was first grown in 1914 and within two years was recognised to be as good as or even better than sorghum as a forage crop, being semi-permanent, able to thrive on sullage water, and a heavier yielder than sorghum. The area under it rose from two acres in 1918, to about 12 acres by 1927. The average yield works out to 49,000 lb. and the cost to 570 lb. per rupee, as against 506 lb. per rupee for sorghums and 376 lb. for fodder maize. The cuttings were usually heaviest soon after the south west monsoon, and grew lighter with the approach of flowering during the cold months. Removal of flower heads as they appeared did not improve the fodder yields. As mentioned above Napier's fodder yielded nearly twice as much and so was cheaper to grow but being liable to get too rank and hard-stemmed, it had to be cut earlier. At Hosur, the two grasses have been grown regularly since 1925, with an average yield of 27,500 lb. for guinea grass and 23,900 lb. for the other. Being essentially garden land crops, they have not become very popular on the West Coast. They grew well enough during the monsoon months, but owing to lack of irrigation, got stunted from December to February, just when green forage was needed most. However, guinea grass has been grown at Pattambi along bunds and the sides of water channels. The cost of growing it worked to one Rupee per 655 lb. In the Southern tract, guinea grass has been regularly grown at Koilpatti on about 30 cents in the red soil area since 1917, the annual outturn per acre averaging 49,000 lb. in 6 cuttings.

The Lesser Millets as Fodder. *Cumbu* (*Pennisetum typhoideum*). Although the straw can only be classed as a famine fodder, the green crop is a very useful, short-period forage, eminently suited for making silage. As early as 1879, Benson observed at Saidapet that it "grew very well indeed under irrigation, yielding 15,000 lb. within a period of 75 days or so, although of course it was not quite equal to cholam either in quantity or

‘quality.’ It has been grown under irrigation at Hagari from 1930, with an average acre yield of 11,300 lb., while at Palur the conditions were apparently not so congenial that even as a rainfed crop from July to September the yields worked out to 7,600 lb. per acre. At Chintaladevi also it was a regular irrigated summer fodder, but the yields here were all very low, averaging only 2,300 lb. per acre, probably on account of the inherent low fertility of the soil. At the Central Farm, its usefulness was recognised as early as 1910. It was tested against fodder sorghum in 1933 and produced within 33 days an outturn of 31,000 lb. as compared to 15,000 lb. from sorghum in 104 days. Another advantage of cumbu over sorghum was that it could be cut and fed to stock at any stage of its growth, without danger of hydrocyanic poisoning. In spite of these, however, cumbu has not figured as a fodder crop in subsequent years. For the West Coast cumbu seems to be better suited than sorghum; a variety *Pennisetum leonis*, from Sierra Leone, was tried in 1933 at Taliparamba and grew very well, with an yield of 13,500 lb. as an irrigated crop in the wetlands. At Pattambi, local cumbu has been grown with success since 1930, yielding 9,100 lb. per acre and providing an excellent material for ensilage. In the Koilpatti tract, cumbu is an important food crop of the dry lands; on the farm, a variety from the Belgian Congo was tested in 1916 and found good as an irrigated fodder crop in the red soil area. Local cumbu has also been grown in the red soil, from 1930, and has yielded 16,300 lb. per acre on the average, although on the rainfed black soils, it was definitely inferior to irungu cholam as fodder.

Ragi (Eleusine coracana). Though third in importance among the millet food crops, this has not been tried anywhere as a fodder producer. The straw by itself is only an indifferent fodder, but it improves on ensilage and is then well relished by cattle. *Samai (Panicum miliare)* is another minor millet that has possibilities as a quick-growing fodder. At Saidapet it was reported in 1879, to have yielded 47,000 lb. per acre under irrigation, in two cuttings within 138 days. At Aduturai (1933—1936) it gave 13,200 lb. as green manure, within a period of 55 days, but it has not, somehow been tested any time, as a fodder producer, either at Coimbatore or at Hosur. It was tried at Pattambi without much success, but at Nanjanad it has been very successful, both as a grain crop (the Badagas preferring it to their time-honoured Korali (*Setaria pallidifusca* Stapf & Hubert) as well as a green manure, along with lupins.

Other Grasses. Under this heading are included those intermediate between crops like guinea grass, that are cut and fed, and the genuine pasture grasses. Since, unlike temperate countries, the dry season in India extends from six to eight months (October to May), permanent pastures alternate in most cases between extravagance and penury. Thus, soon after the monsoon, from September till December there is more grass than anyone knows what to do with and later, just when fodder is needed most, there is only bare land, dotted here and there with semi-dry tussocks of grass

Under such conditions, the conservation of the monsoon flush, either as hay or as silage is the only solution. A number of grasses, both indigenous and exotic have been tried in this province, to evaluate their suitability for periodic cuttings, for hay and for making into silage. The more important of these are noted below:—

Kikuyu grass. (*Pennisetum clandestinum*). This was first tried on the Central Farm in 1924 and at Hosur, from slips obtained from the North West Frontier Province. It yielded 19,800 lb. per acre at Coimbatore and was noted as fairly drought resistant, but was less so at Hosur, and was discarded in 1926, as being more suited for pastures than for periodical cuttings. In the cooler habitat of the Hills, however, it fared better. Thus at Nanjanad, it was found to grow very well as a binding grass on bunds, and sides of water channels, able to stand both frost and water logging very well indeed.

Rhodes grass. (*Chloris gayana*), was grown in a small plot on the Central Farm in 1916 and gave great hopes but proved disappointing when grown the next year on a field scale. At Hagari too, it was promising at first in 1917, but suffered so badly from drought in 1919 that its cultivation was given up. At Hosur, however, it has been pronounced remarkably drought resistant, being in fact reported as not very happy at all under irrigations. The average annual yield here has been 10,800 lb. per acre.

Spear grass (*Heteropogon contortus*) This is the most prominent grass of the "grass lands" at Hosur, on about 800 acres each year with an average yield of 1,100 lb. of hay per acre. This crop too, is extremely hardy and drought resistant, being observed to be intolerant of more than 8—10% moisture in the soil. If allowed to ripen fully it becomes not only unpalatable on account of the hard 'spears' or awns, but also somewhat deficient in minerals and feeding value. Cattle consume such ripe hay only in quantities just enough for maintenance but not for any increase in weight or milk production. It is therefore preferable to cut it for hay before flowering, even though the outturn is somewhat diminished thereby, but this, however, was not always practicable, owing to rainy weather just then. It has therefore been necessary to supplement this ripe spear grass hay with other richer feeds. The silage too, from this grass was often found to be very dry, unless care was taken to cut it with the dew on, i. e., before eight in the morning, and pit it immediately. The hay could be rendered more palatable by first combing out the spears in the field by means of a special implement drawn by a single bullock. The grass is allowed to ripen just enough for the spears to get dry and become matted up by the wind, the comb is then set at the requisite height to engage these matted awns and drawn through the crop in the field. The combed-out awns are swept out at the head-lands. Various attempts to replace this grass by other more palatable grasses, at least in the more low lying fields at Hosur, were made but none was a real success. For example, Kolukkattai grass (*Cenchrus ciliaris*) was tried in 1926, but, though it came up well, it was not quite so

drought resistant as spear grass. This Kolukkattai grass has also been tried with varying success at various places in the province but seems to grow best only in the Kangayam tract. Thus at Samalkota, it was reported to be a success in 1933, the only year it was tried there. At Guntur it was tried in 1926, but owing probably to an adverse season, it did not come up well and so was discarded. However, at Chintaladevi, although it took some years to get well established, it eventually proved quite good. No special mention is made of it at the Central Farm, Coimbatore, although some of the paddocks have been put under this grass since 1925.

Abyssinian Teff grass (*Eragrostis abyssinica*). This native of Transvaal was introduced in 1913 with seed from Kew and tried at the Central Farm at Coimbatore. It grew well enough and was relished by cattle, but was not firm rooted enough to stand cutting or grazing. The yields too were rather low and so it was abandoned in 1918. Another grass Efwatkala grass (*Mallinis minutiflora*) was got from Rhodesia in 1922 and grown on the Central Farm for five years. Under irrigation it yielded 17,300 lb. per acre per annum but this too was discarded, as it was found to be rather evil-smelling at certain stages of its growth and was then rejected by cattle.

(To be continued).

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Norwegian and Italian chickens of the same breed differ markedly in temperament, according to Professor N. Jaensch, of the University of Marburg. Professor Jaensch's description of the behaviour of northern and southern chickens reads almost like a popular statement of the difference between Nordic and Mediterranean human races. The northern fowl, he says, walks more proudly, goes quietly and directly on its intended course; the southern bird is more excited and agitated and dashes about moving its head continually. The Norwegian chicken eats until it has had enough and then quits; the Italian can be induced to overeat if it sees its fellow-fowls picking up grain.